

Book Reviews

Nonionic Surfactants: Alkyl Polyglucosides. Surfactant Science Series. Volume 91. Edited by Dieter Balzer (Haltern-Lavesum, Germany) and Harald Lüders (Rohm GmbH, Darmstadt, Germany). Marcel Dekker: New York and Basel, Switzerland. 2000. 560 pp. \$185.00. ISBN 0-8247-9390-0

Volume 91 of the Surfactant Science Series focuses on alkyl polyglucosides, a specific class of nonionic surfactant, commonly referred to as APGs. Unlike ethoxylated nonionic surfactants, the hydrophilic moiety of alkyl polyglucosides arises solely from the saccharide headgroup and is characterized by the average number of D-glucose units, which may vary from 1 to 5, but is more commonly on the order of 1–2. The hydrophobic alkyl chain may be either linear or branched and typically contains 6–18 carbon atoms. During the past 10–20 years, alkyl polyglucosides have received increasing attention due to their compatibility and synergistic effects when combined with other surfactants, as well as their relatively low toxicity and minimal environmental impact. The latter point is particularly important given the heightened awareness of ecotoxicity issues associated with certain nonionic surfactants, such as the alkylphenol ethoxylates, which are known to be recalcitrant and toxic in aquatic environments.

The text is designed as a reference for alkyl polyglucosides, rather than nonionic surfactants in general, and covers topics ranging from chemical synthesis to toxicology and applications. The first chapter serves as a very brief introduction to alkyl polyglucosides, while Chapter 2 focuses on chemical structure and nomenclature. Given the level of detail provided in subsequent chapters and the chemical complexity of these surfactants, uninitiated readers would benefit from an expanded description of this material at an introductory level, as well as additional figures to illustrate the major synthesis pathways and tables to summarize structure and nomenclature for commercially available alkyl polyglucosides. Chapter 3 provides a detailed description of glucoside and polyglucoside synthesis, with many useful insights, including process guidelines and pitfalls to avoid. Although the chemical derivatization material presented in Chapter 4 is relevant, this very brief discussion (seven pages) should have been incorporated within Chapter 3.

At close to 200 pages, Chapter 5 (“Surfactant Properties”) represents the main body of the text. Important surfactant properties, such as phase behavior, micelle formation, and interfacial tension, are presented in detail for both alkyl glucosides and alkyl polyglucosides. The chapter provides an excellent discussion of alkyl polyglucoside behavior in aqueous solutions, with specific examples and detailed explanations. This information will be of value to anyone working with alkyl

polyglucosides, in either pure form or surfactant mixtures. The subsequent chapter (Chapter 6) deals with the chemical analysis of alkyl polyglucosides, including spectroscopic and chromatographic methods, derivatization and titration, and enrichment techniques for environmental samples. Although this material will be of considerable interest to readers who must deal with quantification and analysis of alkyl polyglucosides, the relatively brief descriptions of each method will serve only as a starting point for a more detailed literature search.

The ecology of alkyl polyglucosides, specifically biodegradation and ecotoxicity, is presented in Chapter 7. The biodegradation section focuses on standard tests used to measure the disappearance of O₂ and the production of CO₂ in water and wastewater, with a very limited discussion of biodegradation under anaerobic conditions and metabolic pathways. A brief description of standard methods used to assess ecotoxicity and results pertaining to alkyl polyglucosides are presented in the latter half of Chapter 7. The discussion of toxicology and dermatology presented in Chapter 8 follows a similar vein, with a brief description of test methods followed by results. Although the information contained in Chapters 7 and 8 is of value, the limited detail, along with the reliance on unpublished data and regulatory reports (particular in Chapter 8), leads to a rather cursory treatment of these topics. However, the final chapter of the text (Chapter 9) provides very detailed descriptions of numerous applications of alkyl polyglucosides in detergents, personal care products, and technical processes, such as enhanced oil recovery. The level of depth and insight provided in this chapter is exceptional given the number of topics covered.

In summary, Volume 91 of the Surfactant Science Series provides a timely synthesis and review of pertinent information related to alkyl polyglucosides. Despite some minor shortcomings, the text is likely to serve as an essential reference for scientists and engineers working with alkyl polyglucosides, either as formulated products or as cosurfactant additives. The chapters dealing with chemical synthesis, surfactant properties, and applications (Chapters 3, 5, and 9, respectively) are noteworthy for both the breadth and detail provided. In addition, the cited literature is extensive, spanning fundamental work as well as recent advances. The authors should be commended for distilling such a large body of complex information into a concise reference text.

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